Intellectual Property Rights and Entry Choices

Abstract

This paper studies the relationship between intellectual property rights (IPR) and the entry modes decision by multinational firms. When considering exports, foreign direct investment (FDI), and licensing as technology transfer channels, the empirical analysis of the 1995 U.S. data show that unlike the findings in the literature, strong IPR has a larger positive impact on FDI than on licensing.

JEL classification: F14, L20

Keywords: Entry modes, multinational firms, intellectual property rights, foreign direct investment, licensing

1. Introduction

National standards for intellectual property rights (IPR) protection vary widely between countries. Many discussions suggest that inadequate IPR protection should deter technology transfer since the imitation generates losses to firms conducting innovations. According to a study by the United States International Trade Commission (2005), worldwide losses due to copyright piracy are estimated to be around $25-30 billion per year. Because of this, IPR protection law should influence the multinational firms' decision to transfer technology to different host countries as well as influence the choice of technology transfer channel: exporting, foreign direct investment (FDI), and licensing. However, it has been unclear in the literature whether strong IPR protection in a host country would lead to a larger transfer in exports, FDI, or licensing.

While the theoretical literature shows that innovation is promoted when IPR enforcement increases, there is an ambiguity in the direction of how IPR affects each choice of entry.[1] However, as Ferrantino (1993) notes, all the preceding models suffer from a fundamental problem: it is assumed that multinational firm (MNE) is allowed to access other countries through only one channel, either FDI or licensing. A more complete study requires that MNE be given the option of all channels to transfer its technology. Fosfuri (2000) allows for three modes of entry: export, FDI and licensing; however, imitation is allowed only under licensing. Puttitanun (2006) allows for three modes of entry with imitation in all three modes and finds that FDI can be more responsive to IPR in some industries while licensing can be more responsive to IPR in other industries. This prediction deviates from the traditional belief (internalization theory) that licensing should be more responsive to IPR than any other modes. The deviation in predictions comes from the fact that the internalization theory only considers the level of imitation rates across modes while Puttitanun (2006) considers both the level and the relative changes of imitation rates due to changes in IPR.

[1] On one hand, Helpman (1993) and Lai (1998) find that FDI is promoted when IPR enforcement increases. Yang and Maskus (2001) find that licensing increases with stronger IPR. On the other hand, Glass and Saggi (2002) argue that FDI will decrease with stronger IPR protection.

With the exception of Smith (2001),[2] existing empirical studies mostly consider separate effects of IPR on a single mode of entry[3]. Using an aggregate data set of 50 countries, Smith (2001) finds that the effect of IPR on licensing is larger than those on export and FDI.

Since existing literature is comprised of ambiguity prediction in theoretical studies and very few empirical studies, this paper adds to the literature in several ways. First, the analysis accounts for simultaneous effects of IPR on exports, FDI, and licensing. Second, in addition to Smith (2001), a larger data set obtained from the Bureau of Economic Analysis (BEA) is disaggregated into industry level (115 industries in 62 countries), which allows me to investigate the effects of industry differences on entry mode decision by MNE. Third, since the export, FDI and licensing data are in the form of number of firms engaging in these activities, it allows me to study the effect of IPR on the *probability* of each entry mode. Therefore, I can analyze what encourages MNE to switch their mode of entry, while the use of volume data cannot.[4]

It is found that strong IPR reduces the exports while increasing both FDI and licensing. Contrary to Smith (2001), an increase in IPR results in a higher probability of FDI than does licensing. This suggests that the incentive for internalization remains strong with high IPR. This incentive, however, does become lower in industries with high R&D, perhaps due to reduced threat of imitation in these industries.

The rest of the paper is organized as follows: Section 2 describes the econometric methodology and data set; Section 3 provides the core empirical analyses; Section 4 presents concluding remarks.

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[2] Maskus (1998) and Ferrantino (1993) have also considered the simultaneous decisions of entry modes, but they allow only two modes of entry: export and FDI.

[3] For example, Maskus and Penubarti (1995) and Smith (1999) study the impact of IPR on trade alone; Lee and Mansfield (1996) analyze the impact of IPRs on FDI alone; Yang (1998) links IPR with licensing alone; Bascavusoglu and Zuniga (2002) and Nicholson (2001) link IPR with FDI and licensing but study effects of IPR on each mode of entry separately.

[4] Ferrantino (1993), Maskus (1998) and Smith (2001) all use volumes of trade, FDI and licensing fees in their studies.

2. Econometric Methods and Data

2.1 Econometric Methods

The econometric methods in this paper involve two parts. First, to initially analyze the signs of factors affecting the technology transfers, a fixed-effect negative binomial regression on each mode of entry separately is performed. Second, a multinomial logit model is used to further analyze the effect of strengthening IPR protection, including changes in other variables, on the probability of MNEs choosing a particular entry mode.

The first empirical model studies the directions of the effect of each independent variable on each entry mode. Since the data on export, FDI, and licensing activity are in the form of number of firms engaging in a certain activity in each industry in each country, the fixed-effect[5] negative binomial regression[6] is used in the analysis. Based on the literature, the structural model to be estimated can be expressed as follows:

$$\text{EX} = \text{f}(\alpha_n, A_n, t_n)$$

$$\text{FDI} = \text{f}(\alpha_n, A_n, F_n, w_n)$$

$$\text{LIC} = \text{f}(\alpha_n, A_n, w_n)$$

where α_n represents IPR protection, A_n denotes market size, t_n represents transportation cost variable, F_n denotes fixed cost, and w_n denotes effective wage rate in destination country[7].

To compare the effects of dependent variables across the three modes of entry, the second empirical analysis involves studying the effects of independent variables on the probability of choosing each entry mode. The appropriate econometric model to be used here is a multinomial logit model with three choices: export, FDI and licensing. I assume that a firm will choose to engage in only one mode of entry at each time of decision. Therefore, our dependent variable

[5] Since there might be common characteristics of each industry that cannot be captured by any variable, the fixed effect model is applied to take into account of these specific effects.
[6] See Long (1997) for a more detailed explanation of the negative binomial regression model.
[7] The effective wage rate per one unit of production in country *n* can be calculated from multiplying the real wage rate per worker to the number of workers needed to produce one unit of good.

assumes three possible values: 0 for a firm engaging in export, 1 for a firm engaging in FDI, and 2 for a firm engaging in licensing.

2.2 Data

The data on dependent variables (FDI, licensing and export) are obtained from the Bureau of Economic Analysis' survey reports through the Bureau of Census[8]. These data detail the number of U.S. manufacturing multinational firms engaging in FDI or licensing in 1995 and exporting in 1994.[9] These data are disaggregated to 3-digit BEA industry code.[10] The data represent 115 industries in 62 countries.

Following Smith (2001) and Puttitanun (2006), It can be summarized that the decision on each entry choice depends on IPR protection, market size, fixed cost variables, transportation costs and wage rate in the host countries.

The 1990 GP index[11] a common measurement of intellectual property rights protection developed by Juan C. Ginarte and Walter G. Park (1997) is used to measure IPR protection. This index ranges from 0 to 5, with higher numbers reflecting stronger levels of protection. I use the 1990 GP index to allow for a time lag between the IPR measure (1990) and data on modes of entry (1995) to ensure that the GP index is exogenous.

Population of the recipient country (in thousands) is used as a measure of country *n*'s market size. The real per capita GDP of the recipient country is used as a measure of the development level of the recipient country. Therefore, the real per capita GDP can be a proxy for the absorptive capacity of the host country. These data are collected from the PennWorld6.1

[8] These data are kindly provided by Raymond Mataloni, Bureau of Economic Analysis.

[9] For FDI, the data represents the number of U.S. firms that have overseas affiliates. For licensing, the data represent the number of U.S. firms that receive licensing or loyalty fees from an unaffiliated party. For export, the data represent the number of U.S. firms that export to an unaffiliated party.

[10] A table listing BEA 3-digit industry codes and names is available upon request.

[11] Juan C. Ginarte and Walter G. Park (1997) examined the patent laws of a comprehensive number of countries, considering five components of the laws: duration of protection, extent of coverage, membership in international patent agreements, provisions for loss of protection, and enforcement measures.

Table. For data on effective wage rate of country *n*, I use wage rate, collected from Occupational Wages Around the World Database[12] by Freeman and Oostendorp. The data, which are downloaded from the NBER website, are divided by the labor productivity or unit labor input requirement. Labor productivity is calculated by dividing real GDP by the labor force data that are collected from the World Development Statistics CD-ROM. The distance from country *n* to the U.S. is a good proxy for transportation costs. The distance, in kilometers, from each country's national capital to Washington D.C., obtained from http://www.indo.com/distance/index.html, is used. The distance variable can also be used to capture the fixed cost variable when MNE engages in FDI. Distance can portray the difference in culture, the custom of doing business or maybe even language barrier. The further the countries are, the more differences they might have, and therefore, the higher the fixed cost of setting up a plant there. Another variable that might well capture the fixed cost variable[13] is an economic freedom index. These data are collected from the Economic Freedom of the World 1997, Annual Report (Gwartney and Lawson, 1997). The economic freedom index[14] ranges from 0 to 10, with a higher value indicating a higher level of economic freedom. A higher value on the economic freedom index should translate to a lower fixed cost variable.

To study how technology level differences affect entry mode decisions, the R&D expenditure is used to separate industries into two groups: a high technology group and a low technology group. This R&D index, collected from Nicholson (2001), is measured by using all costs related to the development of new products and services.

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[12] For more details about this data set, see Freeman and Oostendorp (2000).

[13] Another possible measure for fixed cost is the investment cost index developed by Carr, Markusen, and Maskus (2001). This index is an average of 10 indices of perceived impediments to investment, reported in the World Competitiveness Report of the World Economic Forum. This index is computed on a scale from 0 to 100, with a higher number indicating higher investment costs.

[14] The central elements of this index are personal choice, freedom of exchange and protection of private property, and provision of a stable infrastructure.

Descriptive statistics for the data set are summarized in Table 1. More detailed statistics on means and standard deviations of independent variables, separated by mode, are summarized in Table 2.[15]

(Add Table 1 here)

(Add Table 2 here)

Table 2 contains some statistics that are worth noting. Out of the three modes, the average value of IPR are higher in FDI and licensing compare to that of the export mode. Economic freedom value is the highest in FDI mode. Moreover, investment cost is lowest in FDI mode. However, more can be said with the regression analysis in Section 3.

3. Empirical Analysis

The empirical analysis starts with the negative binomial regression model to initially analyze the signs of factors affecting the technology transfers. Table 3 reports results of the specific effect negative binomial regression model on all three modes separately.[16] The second, third and forth columns show the coefficients, along with the standard errors in parentheses, of export, FDI, and licensing channel, respectively.

(Add Table 3 here)

IPR does enhance ownership advantage; therefore, it increases FDI and licensing activity (but is not significant in export mode). Market size, captured by *POP* variable, confirms the size effect. As expected, distance negatively affects export activity and FDI. Higher values on the economic freedom index have a positive effect on FDI activity, which confirms that an increase in fixed cost reduced the FDI profitability, and therefore decreases FDI activity. Wage in the host country negatively affects both FDI and licensing activity due to an increase in the cost structures

[15] In Table 2, mean and standard deviation in each mode are those over all the countries that have at least one instance of that particular mode.

[16] The investment cost variable is dropped in Table 3 due to lack of data; there are 62 countries in the data set, but only 35 countries that have data on investment cost. The qualitative results do not change when adding this variable to the model.

of both modes. Higher per capita GDP increases all activities. The intuition behind this is that a higher level of development attracts more multinational technology transfers. One interesting observation is that the coefficient of IPR is larger for FDI than licensing. However, the analysis in Table 3 considers the impact of independent variables on each entry mode separately and it might therefore be misleading to compare the size of the coefficients to one another.

The best way to compare the size of the effect on each mode of entry, given the nature of our dependent variables, is to use the multinomial logit model. Table 4 reports the results with export mode being a based category.[17] The second and third columns show estimated coefficients, along with standard errors in parentheses, for FDI and licensing, respectively. To aid interpretation, the marginal effects of the covariates on the predicted probability of each entry mode are presented in column 4, 5, and 6[18]. The multinomial logit model embeds the assumption of Independence of Irrelevant Alternatives (IIA). If this property fails to hold the maximum-likelihood coefficients may be biased. We address this concern by running the Small-Hsiao IIA test for all specifications (Small and Hsiao (1985)). The results of the test show that in all cases (including those that will be introduced later) we cannot reject the null hypothesis of IIA, indicating that use of the multinomial logit estimator is appropriate.

Evaluating at the average value of each dependent variable, the probability of a firm choosing FDI mode is the highest, 0.467, slightly higher than the probability of choosing the export mode, 0.430. Licensing mode will be chosen with a probability of only 0.103.

(Add Table 4 here)

At the mean level, an increase in economic freedom index increases the probability of choosing FDI, but decreases the probability of choosing either exporting or licensing. Economic freedom captures political stability and governmental control. When economic freedom is low, a firm might be less willing to handle these problems by themselves and would either export to that

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[17] The investment cost variable is dropped for the same reasons as in the regression analysis in Table 3.
[18] The probabilities at the mean of all independent variables are used in calculating these values.

particular market or let a local agent who knows more about the market and how to deal with the government, handle these problems. Once a country becomes more politically stable or once a firm knows more about a country, it will be willing to invest and do the business themselves. This confirms the idea that the lack of knowledge of a foreign market adversely affects FDI.[19]

A longer distance decreases the probability of choosing FDI mode, but increases the probability of choosing exporting or licensing. This result is surprising and somewhat contradicts a widely belief that distance should negatively affect export. However, as explained earlier, distance may capture the difference in culture, the custom of doing business or even language barrier, which can be translated to the fixed cost variable in engaging in FDI. Therefore, this result might occur because the fixed cost effect outweighs the transportation cost effect; an increase in distance decreases the probability of engaging in FDI activity but in turn increases the probability of exporting and licensing.

At the mean level, an increase in market size (population) increases the probability of choosing FDI, but decreases the probability of choosing either export or licensing.[20] When MNE decides to engage in FDI in a larger market, it can benefit from lower average fixed cost compared to a smaller market.

An increase in the per capita GDP increases the probability of FDI but decreases the probability of exporting and licensing. The higher the per capita GDP, and the higher the development level of the host countries, the better the absorptive capacity of the host countries are. In order for MNE to directly invest, it requires that host countries have a certain amount of high quality labor as well as a high absorptive capacity. MNE must make sure that the host

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[19] An example of this (appearing in Contractor (1985)) is the experience of Boots, a British pharmaceutical company that chose to license the production of ibuprofen to Upjohn in the U.S. because of the marketing and sales advantage enjoyed by Upjohn. Upjohn marketed ibuprofen very successfully under the brand name “Mortrin.” When Boots eventually chose to enter the U.S. market itself, and tried to compete with Upjohn, using its own brand Rufen, it could not gain a large market share despite lower prices.

[20] An alternative for the market size variable is the GDP of the recipient country. The qualitative results in Table 4 remain when using GDP instead of population.

countries have the ability to produce its products. In other words, higher quality workers attract more FDI.

The effective wage rate does not have a significant impact on the probability of a firm choosing any of the technology transfer modes.

An increase in IPR index increases a firm's probability of choosing FDI more than it increases the probability of choosing license. A higher value on the IPR index decreases the probability of choosing export. This result contradicts Smith (2001) and the traditional belief[21] that licensing should be more responsive to IPR than to FDI. However, Puttitanun (2006) asserts that the size of the effect of IPR on FDI and licensing depends on both the level and the relative changes of imitation rates due to changes in IPR. FDI can be more responsive to IPR if profit loss due to imitation though licensing is larger than it is through FDI and at the same time, when the IPR regime changes, this profit loss in licensing is adjusted at a slower rate than it is in FDI mode. Moreover, different industries react to IPR differently. Some industries such as the pharmaceutical industry and chemical industry rely more heavily on IPR than industries like paper or lumber. Therefore, it could be the case that in some industries, FDI is more responsive to IPR while licensing is more responsive to IPR in other industries.

To better understand the effect of IPR protection on a firm's probability of choosing each entry mode, predicted probabilities of each mode at different values of IPR index are summarized in Table 5.[22] When other variables are held at their mean level, an increase in IPR protection increases the probabilities of choosing FDI and licensing while decreasing the probability of choosing export. This confirms the location advantage concept. Moreover, an increase in IPR tends to increase the probability of FDI more than it increases the probability of licensing

[21] This belief holds that by licensing, a firm allocates their knowledge assets outside the source firm, which increases the likelihood of imitation, and that the firm can reduce the likelihood of imitation by internalizing their knowledge assets by employing FDI. Therefore, an increase in IPR, which reduces the likelihood of imitation should increase licensing probability more than FDI.

[22] This table is constructed using the regression results from Table 4 and the mean values of all other variables.

regardless of the initial level of IPR. Based on the results here, on average, firms prefer to engage in FDI more than licensing when they are confident in IPR protection. If IPR protection is exceedingly weak, they prefer export.

(Add Table 5 here)

Moreover, as suggested by Smarzynska (1999), in general, different industry attributes such as R&D intensity would react differently in terms of mode of entry. Therefore, I add the R&D variable into the model. A higher R&D expenditure decreases the probability of FDI while increasing the probability of export and licensing modes. This result suggests that in an industry with a higher R&D, there is a lower tendency for an MNE to engage in FDI. This might be due to the fact that products in high R&D industries are harder to be imitated, and, therefore, MNE is more willing to license its technology to the local firms more, thereby reducing the probability of doing the FDI. It could also be the case that high R&D industries involve high fixed cost which makes FDI less attractive.

Since this finding is very interesting and deserves to be further explored, I next separate the data into two groups: high R&D and low R&D groups,[23] and use the same multinomial logit model regression analysis to study whether the difference in each industry's technology level affects the results of entry mode decisions.

I separate industries according to their R&D intensity and perform the same analysis. Tables 6 and 7 report the regression results of the low R&D group and high R&D group, respectively.

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[23] The high R&D industries are those industries that have R&D index value ≥ 0.03, and the low R&D industries are those that have R&D index value < 0.03.

(Add Table 6 here)

(Add Table 7 here)

Comparing the results in Table 4 to Tables 6 and 7, It is found that most of the qualitative results do not change much.[24] However, there is an interesting result worth mentioning. Even though it is still the case that an increase in IPR increases the probability of choosing FDI or licensing while decreasing the probability of exporting in both high and low R&D groups, in industries with a low R&D index value, the difference between the effects of IPR on FDI and licensing is larger than that observed in the high R&D index industries. It could be suggested that even when IPR increases, firms insist on internalizing their knowledge through FDI mode, and that this behavior is practiced more in low R&D industries where technology is more easily imitated. In other words, firms will hold on to their knowledge asset unless they are certain that their knowledge will not be imitated easily.

In order to see the argument mentioned above more clearly, I add the interaction term between the IPR and R&D variables to the analysis as shown in Table 8.[25]

(Add Table 8 here)

The results are qualitatively the same as those in Table 4 on all variables. The IPR variable still shows negative effects on export and a larger positive effect on FDI than on licensing. The interaction term of IPR and R&D shows a negative sign on the FDI mode while showing a positive sign on both export and licensing modes. This finding confirms the argument claimed above. It can be inferred that in the low-tech industries, IPR can have larger effect on FDI. However, for high R&D industries (high-tech industries), IPR can influence licensing more than FDI.

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[24] There are several exceptions. Population is now insignificant to export and FDI for the low R&D group, and effective wage rate now has a significant negative impact on the probability of engaging in FDI for the high R&D industries.

[25] Another analysis is attempted using the interaction term and R&D variable without the IPR. The same conclusion can be drawn.

To summarize, it is found that an increase in IPR index increases the probability of choosing FDI more than it increases the probability of choosing licensing mode, and it decreases the probability of choosing export. However, the incentive to internalize will be reduced in the high-tech industries. An increase in fixed cost (a decrease in economic freedom index and an increase in distance) decreases the probability of choosing FDI and increases the probability of choosing export and licensing. An increase in market size increases the probability of choosing FDI, but decreases the probability of choosing export and licensing.

4. Conclusion

This paper studies the effects that a country's intellectual property rights protection have on U.S. multinational firms' modes of entry into the country. A key feature of our analysis is allowing a simultaneous consideration of export, FDI, and licensing. The empirical analysis utilizes a data set of U.S. firms disaggregated into 3-digit industry level, which allows us to investigate not only the effects of IPR on entry modes in aggregate levels, but also the possible differences of these effects across industries. Strong IPR enhances location advantage, in the sense that there is more FDI and licensing as IPR gets stronger. Surprisingly, however, the probability of licensing does not increase as much as the probability of FDI does, suggesting that the relationship between IPR and the incentive for internalization is more complicated than was first thought of in the literature. It is important to consider not only the level but also the speed of change of imitation due to IPR across modes. When the data set is divided into a hi-tech and a low-tech industry groups, this result holds for both groups but becomes more pronounced in the low-tech group, suggesting that MNEs internalize their knowledge assets more in the low R&D group where imitation is easier. Internalization incentive is reduced when the technology of MNE is more complicated and less easily imitated (in the high R&D group).

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Table 1: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Export	7130	1.818	4.229	0	59
FDI	7130	2.001	5.670	0	98
License	7130	0.513	1.628	0	22
IPR	62	3.041	0.942	0.33	4.24
Econ Freedom	62	6.401	1.075	2.7	9.3
Distance	62	7696.239	4224.059	732	16355
Population	62	57410.19	105102.2	267.4	929358
Per capita GDP	62	16349.62	6918.539	1071.601	24736.96
Effective Wage	62	0.036	0.016	0.014	0.214
R&D	115	0.033	0.042	0	0.484
Investment Cost	35	40.508	8.546	27.13	61.44

Table 2: Mean and Standard Deviation in Each Mode

Variable	Export	FDI	License
IPR	2.872 (1.002)	3.189 (0.848)	3.066 (0.967)
Econ Freedom	6.306 (1.172)	6.506 (0.975)	6.323 (1.046)
Distance	8055.707 (4355.932)	7223.176 (4096.596)	8267.254 (4040.26)
Population	63724.85 (126439.8)	51691.58 (82596.21)	57340.3 (98768.32)
Per capita GDP	14977.78 (7412.237)	17742.53 (6106.475)	15777.95 (7036.594)
Effective Wage	0.036 (0.019)	0.035 (0.012)	0.036 (0.014)
R&D	0.037 (0.041)	0.027 (0.041)	0.043 (0.045)
Investment Cost	41.862 (9.137)	39.105 (7.754)	41.567 (8.608)

Note: Means are shown together with standard deviations in parentheses.

Table 3: Negative Binomial Regression Model†

Variable	Export	FDI	License
Constant	-0.462* (0.073)	-2.717* (0.215)	-0.214 (0.149)
IPR	-0.018 (0.024)	0.385* (0.031)	0.285* (0.036)
EF	-	0.380* (0.031)	-
DIST	-1.78e-05* (4.45e-06)	-1.28e-04* (6.88e-06)	-
POP	1.80e-06* (9.05e-08)	3.12e-06* (1.41e-07)	1.78e-06* (1.58e-07)
GDPCAP	6.7e-05* (2.97e-06)	2.53e-05* (4.59e-06)	3.72e-05* (4.99e-06)
W	-	-12.569* (1.499)	-11.568* (1.466)
N	6555	4715	4715
Log-likelihood	-8663.1482	-7121.0362	-3304.7026

Note : Estimated coefficients are shown together with the standard error in parentheses. * denotes that a variable is statistically significant at the 1% significance level. †: I also performed random effect negative binomial regressions in export, FDI, and licensing equations. The results are qualitatively similar.

Table 4 : Multinomial Logit Model
(Based Category : Export)

	Model Estimates[1]		Marginal Effect on Probabilities[2]		
Variable	**FDI**	**License**	**Export**	**FDI**	**License**
			Predicted Probabilities		
Constant	-0.959* (0.128)	-2.080* (0.199)	0.430	0.467	0.103
			Marginal Effect		
IPR	0.181* (0.024)	0.297* (0.038)	-0.050* (0.006)	0.031* (0.006)	0.019* (0.003)
Economic Freedom	0.090* (0.019)	-0.043 (0.030)	-0.016* (0.004)	0.024* (0.005)	-0.008* (0.003)
Distance	-5.57e-05* (3.78e-06)	1.24e-05* (6.28e-06)	1.07e-05* (0.000)	-1.45e-05* (0.000)	3.81e-06* (0.000)
Population	3.34e-07* (1.49e-07)	-4.48e-08 (2.16e-07)	-6.50e-08* (0.000)	8.52e-08* (0.000)	-2.01e-08 (0.000)
Per Capita GDP	3.26e-05* (3.77e-06)	-5.30e-06 (5.73e-06)	-6.32e-06* (0.000)	8.38e-06* (0.000)	-2.05e-06* (0.000)
Effective Wage	0.204 (1.033)	-0.817 (1.568)	-0.005 (0.236)	0.090 (0.248)	-0.085 (0.140)
R&D	-6.897* (0.434)	1.892* (0.436)	1.302* (0.093)	-1.808* (0.105)	0.505* (0.041)
Small-Hsiao IIA test (χ^2)	2.778	3.742			
N	21208				
Log-likelihood	-19525.826				

Note: 1. Estimate coefficients are shown together with the standard error in parentheses. * denotes that a variable is statistically significant at the 5% significance level.
2. Predicted probabilities and marginal effects are based on the values at the mean of all independent variables.

Table 5 : Predicted Probability of Entry Modes by IPR Index Level

	Probability		
IPR	**Export**	**FDI**	**License**
0	0.578	0.365	0.057
1	0.529	0.400	0.070
2	0.480	0.435	0.085
3	0.430	0.467	0.103
4	0.381	0.496	0.123
5	0.334	0.521	0.145

Note: Predicted Probabilities are calculated by holding other independent variables at their mean level.

Table 6: Low R&D Group

(Based Category : Export)

	Model Estimates[1]		Marginal Effect on Probabilities[2]		
Variable	**FDI**	**License**	**Export**	**FDI**	**License**
			Predicted Probabilities		
Constant	-0.951* (0.156)	-2.211* (0.268)	0.377	0.539	0.084
			Marginal Effect		
IPR	0.193* (0.030)	0.323* (0.051)	-0.049* (0.007)	0.033* (0.007)	0.016* (0.004)
Economic Freedom	0.057* (0.024)	-0.026 (0.040)	-0.011* (0.005)	0.015* (0.006)	-0.005 (0.003)
Distance	-5.21e-05* (4.66e-06)	2.57e-05* (8.50e-06)	9.77e-06* (0.000)	-1.41e-05* (0.000)	4.34e-06* (0.000)
Population	1.47e-07 (1.87e-07)	-1.26e-07 (2.89e-07)	-2.58e-08 (0.000)	4.22e-08 (0.000)	-1.64e-08 (0.000)
Per Capita GDP	4.26e-05* (4.67e-06)	-1.34e-05 (7.57e-06)	-8.22e-06* (0.000)	1.22e-05* (0.000)	-2.97e-06* (0.000)
Effective Wage	1.042 (1.220)	-1.292 (2.070)	-0.171 (0.273)	0.317 (0.291)	-0.147 (0.153)
Small-Hsiao IIA test (χ^2)	10.347	8.277			
N	13833				
Log-likelihood	-12203.473				

Note : 1. Estimate coefficients are shown together with the standard error in parentheses. * denotes that a variable is statistically significant at the 5% significance level.

2. Predicted probabilities and marginal effects are based on the values at the mean of all independent variables.

Table 7 : High R&D Group

(Based Category : Export)

	Model Estimates[1]		Marginal Effect on Probabilities[2]		
Variable	**FDI**	**License**	**Export**	**FDI**	**License**
			Predicted Probabilities		
Constant	-1.502* (0.199)	-1.341* (0.238)	0.502	0.333	0.166
			Marginal Effect		
IPR	0.193* (0.038)	0.215* (0.046)	-0.050* (0.008)	0.031* (0.008)	0.019* (0.006)
Economic Freedom	0.122* (0.030)	-0.066 (0.036)	-0.015* (0.007)	0.031* (0.006)	-0.016* (0.004)
Distance	-5.9e-05* (6.11e-06)	2.29e-06 (7.84e-06)	9.65e-06* (0.000)	-1.32e-05* (0.000)	3.57e-06* (0.000)
Population	7.41e-07* (2.22e-07)	-4.51e-07 (2.81e-07)	-8.60e-08 (0.000)	1.89e-07* (0.000)	-1.03e-07* (0.000)
Per Capita GDP	1.75e-05* (5.86e-06)	3.47e-07 (7.08e-06)	-2.94e-06* (0.000)	3.86e-06* (0.000)	-9.15e-07 (0.000)
Effective Wage	-3.569* (1.800)	0.628 (1.888)	0.543 (0.373)	-0.827* (0.386)	0.284 (0.255)
Small-Hsiao IIA test (χ^2)	4.516	2.839			
N	9361				
Log-likelihood	-9315.6377				

Note: 1. Estimate coefficients are shown together with the standard error in parentheses. * denotes that a variable is statistically significant at the 5% significance level.

2. Predicted probabilities and marginal effects are based on the values at the mean of all independent variables.

Table 8 : Interaction between IPR and R&D
(Based Category : Export)

	Model Estimates[1]		Marginal Effect on Probabilities[2]		
Variable	**FDI**	**License**	**Export**	**FDI**	**License**
			Predicted Probabilities		
Constant	-1.169* (0.127)	-1.999* (0.198)	0.430	0.467	0.103
			Marginal Effect		
IPR	0.252* (0.025)	0.273* (0.038)	-0.063* (0.006)	0.050* (0.006)	0.013* (0.003)
Economic Freedom	0.090* (0.019)	-0.042 (0.030)	-0.016* (0.004)	0.024* (0.005)	-0.008* (0.003)
Distance	-5.57e-05* (3.78e-06)	1.23e-05* (6.29e-06)	1.07e-05* (0.000)	-1.45e-05* (0.000)	3.81e-06* (0.000)
Population	3.22e-07* (1.49e-07)	-4.94e-08 (2.16e-07)	-6.25e-08 (0.000)	8.25e-08* (0.000)	-2.00e-08 (0.000)
Per Capita GDP	3.25e-05* (3.77e-06)	-5.44e-06 (5.73e-06)	-6.30e-06* (0.000)	8.36e-06* (0.000)	-2.06e-06* (0.000)
Effective Wage	0.311 (1.032)	-0.847 (1.568)	-0.025 (0.236)	0.118 (0.248)	-0.093 (0.140)
IPR*R&D	-2.347* (0.138)	0.564* (0.142)	0.447* (0.030)	-0.611* (0.033)	0.165* (0.013)
Small-Hsiao IIA test (χ^2)	6.788	11.225			
N	21208				
Log-likelihood	-19504.534				

Note : 1. Estimate coefficients are shown together with the standard error in parentheses. * denotes that a variable is statistically significant at the 5% significance level.
2. Predicted probabilities and marginal effects are based on the values at the mean of all independent variables.